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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,079	08/21/2006	Takashi Goto	291650US0PCT	8078

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EXAMINER	
RIPA, BRYAN D	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
05/15/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/590,079	GOTO ET AL.	
	Examiner	Art Unit	
	BRYAN D. RIPA	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/21/06; 10/4/07; 12/10/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 2 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2 and 13 recite a limitation requiring "the entire surface of said fine particles" to make contact with either the predominantly carbon matrix or other fine particles including elemental ruthenium. However, some of the fine particles would undoubtedly be deposited on the top layer of the particle-dispersed complex and, as a result, at least a portion of their surface would be exposed and not in contact with either the matrix or other fine particles. As such, the claim scope is unclear.

Please note, due to the aforementioned the examiner is interpreting the limitation to require the fine particles on the inside of the deposited layer to have the entire surface making contact with the matrix or other fine particles since this appears to be most in keeping with ¶53 of applicant's specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 3-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Foley et al., (U.S. Pat. No. 6,471,745) (hereinafter referred to as "FOLEY").

Regarding claim 1, FOLEY teaches a particle-dispersed complex (see generally col. 7 line 36-col. 8 line 5) wherein there are fine particles having a diameter of 5-100 nm which includes ruthenium element as a constituent element (see col. 30 lines 15-17 teaching some of the ruthenium metal, i.e. elemental ruthenium, particles having a diameter greater than 5 nm) are dispersed in a matrix having carbon as a main component (see col. 30 lines 8-15 teaching the matrix being a carbon matrix), and said complex has electrical conductivity (it is common knowledge that carbon is electrically

conductive and, as a result, the ruthenium containing nanoporous carbon membrane, i.e. particle-dispersed complex, as disclosed here would be electrically conductive).

Regarding claim 3, FOLEY teaches the particle-dispersed complex wherein the matrix includes carbon black or nanocarbon (see col. 30 lines 8-15 discussing there being nanoporous carbon material, i.e. nanocarbon).

Regarding claim 4, FOLEY teaches the particle-dispersed complex wherein the fine particles are ruthenium metallic fine particles (see col. 30 lines 15-17).

Regarding claim 5, FOLEY teaches the particle-dispersed complex wherein said complex is held on an electrically conductive substrate (see col. 17 lines 41-43 teaching the use of metal supports, i.e. substrates; col. 29 lines 27-40 discussing the use of an electrically conductive substrate, i.e. a metallic stainless steel support for depositing the ruthenium/nanoporous carbon material).

3. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Smith et al., "Evaluation of Precursors for Chemical Vapor Deposition of Ruthenium" *Thin Solid Films* 376, pages 73-81 (2000) (hereinafter referred to as "SMITH") with evidence from Goto et al., "Electrochemical Properties of Iridium-Carbon Nano Composite Films Prepared by MOCVD" Scripta Materialia 44, pages 1187-1190 (2001) (hereinafter referred to as "GOTO") and Kimura et al., "Preparation of RuO2-YSZ Nano-Composite

Films by MOCVD" Surface and Coatings Technology 167, pages 240-244 (2003) (hereinafter referred to as "KIMURA").

Regarding claim 1, SMITH teaches the particle-dispersed complex (see page 77 discussing the studies of the effect of oxygen flow rate on ruthenium deposition) wherein there are fine particles having a diameter of 5-100 nm which includes ruthenium element as a constituent element (see page 78 teaching the deposition of both oxidized and metallic ruthenium, i.e. elemental ruthenium, particles one of which would have a diameter of 5-100 nm) are dispersed in a matrix having carbon as a main component (see page 78 teaching the carbon content being around 75% when there is no oxygen gas added during the deposition process), and said complex has electrical conductivity (it is common knowledge that carbon is electrically conductive and, as a result, the particle-dispersed complex of SMITH would be electrically conductive).

Both GOTO and KIMURA evidence the fact that the particle-dispersed complex of SMITH would have fine particles having a diameter of 5-100 nm (see GOTO page 1187 teaching the carbon deposition effecting the grain growth of noble metals, i.e. ruthenium, to be inhibited so as to form nano-sized particles; see also KIMURA page 240 in the abstract teaching oxidized ruthenium particles having a diameter of around 20 nm when formed by the same process).

Regarding claim 2, SMITH teaches the particle-dispersed complex wherein the entire surface of said fine particles makes contact with at least either said matrix or said

fine particles (see pages 77 and 78 teaching the formation of the particle-dispersed complex by a similar method to that disclosed in applicant's specification, i.e. by MOCVD, thereby creating a particle-dispersed complex having similar structure).

As a result, the prior art inherently discloses the apparatus having the same claimed properties or functions, i.e. the entire surface of the fine particles being in contact with either the matrix or other fine particles. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. See MPEP § 2112.01.

Regarding claim 3, SMITH teaches the particle-dispersed complex wherein the matrix includes carbon black (see page 77 discussing the incorporation/deposition of large amounts of carbon when no O_2 is added during deposition).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over SMITH as applied to claim 1 above, and further in view of GOTO.

Regarding claim 6, SMITH does not teach the particle-dispersed complex wherein the complex is formed on a solid-electrolyte substrate.

However, GOTO teaches a similar particle-dispersed complex which includes different noble metals, iridium and platinum as opposed to ruthenium, wherein the complex is formed on a solid-electrolyte substrate (see page 1187 discussing the formation of Ir and Pt nano-particles in a carbon matrix by MOCVD on solid electrolytes).

Consequently, as shown by GOTO, a person of ordinary skill in the art would accordingly have recognized the predictable solution of using a ruthenium particle-dispersed complex on a solid-electrolyte substrate as an alternative catalyst material potentially having excellent electrical and catalytic properties as an electrode for solid electrolytes.

The Supreme Court decided that a claim can be proved obvious merely by showing that the combination of known elements was obvious to try. The choosing from a finite number of identified, predictable solutions, with a reasonable expectation for success, is likely to be obvious to a person of ordinary skill in the art. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, E.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to substitute the substrate of SMITH with the substrate of GOTO to obtain the predictable result of having the particle-dispersed complex of SMITH formed on a solid electrolyte substrate.

Regarding claim 7, SMITH as modified by GOTO inherently teaches the particle-dispersed complex wherein the interfacial electrical conductivity of the solid electrolyte

substrate and a thin film of the particle-dispersed complex formed on the substrate is 10^{-6} Sm^{-1} or higher and 10^{-2} Sm^{-1} or lower at 190 to 350 ºC (see SMITH pages 77 and 78 teaching the formation of the particle-dispersed complex by a similar method to that disclosed in applicant's specification, i.e. by MOCVD, thereby creating a particle-dispersed complex having similar structure; see also GOTO page 1187 teaching the particle-dispersed complex formed on a solid electrolyte substrate).

As a result, the prior art inherently discloses the apparatus having the same claimed properties, i.e. the interfacial electrical conductivity of the solid electrolyte substrate and a thin film of the particle-dispersed complex formed on the substrate is 10^{-6} Sm^{-1} or higher and 10^{-2} Sm^{-1} or lower at 190 to 350 ºC. If the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. See MPEP § 2112.01.

Regarding claim 8, GOTO teaches the particle-dispersed complex wherein the solid electrolyte substrate is a zirconium oxide substrate which includes a stabilizing agent (see page 1187 teaching the use of a zirconium oxide substrate and yttria stabilizing agent).

Regarding claim 9, GOTO teaches the particle-dispersed complex wherein the complex is an electrode for a solid electrolyte (see page 1188 teaching the use of the noble metal film, i.e. particle-dispersed complex, as an electrode deposited on both sides of the solid electrolyte).

Regarding claims 10 and 11, GOTO teaches the particle-dispersed complex wherein the complex is an electrochemical catalyst (see page 1187 and 1188 discussing the use of the noble metal film, i.e. particle-dispersed complex in an electrochemical oxygen measurement cell where the noble metal acts as a catalyst).

5. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clyde et al., (U.S. Pat. No. 7,097,875) (hereinafter referred to as "CLYDE") and further in view of SMITH and GOTO.

Regarding claim 12, CLYDE teaches a solid electrolyte sensor (see col. 2 lines 31-45).

CLYDE, however, does not teach the electrode being formed of an electrically conductive particle-dispersed complex having dispersed fine particles with a particle diameter of 5 to 100 nm which includes elemental ruthenium as a constituent in a matrix having carbon as a main component which is formed on the surface of a zirconium oxide substrate having a stabilizing agent.

However, SMITH as modified by GOTO teaches the electrically conductive particle-dispersed complex having dispersed fine particles with a particle diameter of 5 to 100 nm which includes elemental ruthenium as a constituent in a matrix having carbon as a main component (see pages 77 and 78 of SMITH and discussion above with respect to the rejection of claim 1 by SMITH) which is formed as an electrode on

the surface of a zirconium oxide substrate having a stabilizing agent (see page 1187 of GOTO and discussion above with respect to the rejection of claim 6).

As shown by GOTO, a person of ordinary skill in the art would accordingly have recognized the predictable solution of using a ruthenium particle-dispersed complex on a solid-electrolyte substrate as an alternative catalyst material potentially having excellent electrical and catalytic properties as an electrode for solid electrolytes.

The Supreme Court decided that a claim can be proved obvious merely by showing that the combination of known elements was obvious to try. The choosing from a finite number of identified, predictable solutions, with a reasonable expectation for success, is likely to be obvious to a person of ordinary skill in the art. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, E.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to substitute the substrate of SMITH with the substrate of GOTO to obtain the predictable result of having the particle-dispersed complex of SMITH formed on a solid electrolyte substrate.

As shown by SMITH as modified by GOTO, a person of ordinary skill in the art would accordingly have recognized the use of the electrically conductive particle-dispersed complex acting as an electrode on the surface of a zirconium oxide substrate having a stabilizing agent to facilitate the electrochemical measurement of a solid electrolyte sensor.

The simple substitution of one known element for another is likely to be obvious when predictable results are achieved. See *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, B.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the particle-dispersed complex for use as an electrode in obtain the predictable result of having using the electrode in a solid electrolyte sensor.

Regarding claim 13, see discussion above with respect to claim 2 as to how CLYDE as modified by SMITH and GOTO discloses the entire surface of the fine particles making contact with either the matrix or other fine particles.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN D. RIPA whose telephone number is 571-270-7875. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. D. R./
Examiner, Art Unit 1795

/Brian J. Sines/

Supervisory Patent Examiner, Art Unit 1795